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Nonlinear Secondary Oceanic Flows--Augmentation (AASERT)

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6. AUTHOR(S)

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

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13. ABSTRACT (Maximum 200 words)

The goal of the AASERT grants was to provide support of graduate students to augment existing ONR Programs. The AASERT grant was provided to augment N00014-91-J-1560 in the CORE program. The AASERT fellow is Mr. John H. Holdzkom II who is pursuing a Ph.D. in oceanography at the Center for Coastal Physical Oceanography. He came into the program with a B.S. (with honors) in physics from Old Dominion University. This progress has been excellent. Mr. Holdzkom has worked on both the core grant and the ARI (N00014-93-10567). He has made two presentations at national and international meetings, is a co-author of "An Investigation of the Ability of Nonlinear Methods to Infer Dynamics from Observables" (Tsonis et al., Bull Am. Meteor. Soc., 1994), and the sneior author of "A comparison of a Hydrodynamic Lens Model to Observations of a Warm Core Ring" which is under review with the Journal of Geophysical Research. Currently the bulk of this effort is devote to the ARI. It is anticipated that he will use this model as part of his dissertation.

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Unclassified

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ONR Progress Report
Section A. Progress abstract.

I.

A. D. Kirwan, Jr.

N00014-93-1-0842: *Nonlinear secondary oceanic flows--Augmentation*
(AASERT)

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II. Progress Abstract

The goal of the AASERT grants was to provide support for graduate students to augment existing ONR programs. The AASERT grant was provided to augment N000-14-91-J-1560 in the CORE program.

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Currently the bulk of his effort is devoted to the ARI. It is anticipated that he will use this model as part of his dissertation.

Section B. List of publications/presentations/reports

- P-Toner, M., and A. D. Kirwan, Jr., 1994: Periodic and homoclinic orbits in a toy climate model. *Nonl. Proc. Geophys.*, **1**, 31-40.
- P-Mullen, C. P., and A. D. Kirwan, Jr., 1994: Surface flow structure of the Gulf Stream from composite imagery and satellite-tracked drifters. *Nonl. Proc. Geophys.*, **1**, 64-71.
- P-Kirwan, A. D., Jr., B. L. Lipphardt, Jr., and K. L. Gregory, 1994: Nonlinear ocean dynamics. *The Oceans: Physical-Chemical Dynamics and Human Impact*. The Pennsylvania Academy of Science. S. K. Majumdar, E. W. Miller, G. S. Forbes, R. F. Schmalz, and A. A. Panah, Eds.
- P-Eremeev, V. N., A. D. Kirwan, Jr., and T. M. Margolina, 1994: Amount of ^{137}Cs and ^{134}Cs radionuclides in the Black Sea produced by the Chernobyl disaster. *J. Environ. Radiol.*, in press.
- P-Eremeev, V. N., L. M. Ivanov, A. D. Kirwan, Jr., and T. M. Margolina, 1994: Analysis of the Cesium pollution in the Black Sea by regularization methods. *Mar. Poll. Bull.*, in press.
- P-Ivanov, L. M., A. D. Kirwan, Jr., and O. V. Melnichenko, 1994: Prediction of the stochastic behaviour of nonlinear systems by deterministic models as a classical time passage probabilistic problem. *Nonl. Proc. Geophys.*, in press.
- P-Tsonis, A. A., G. N. Triantafyllou, J. B. Elsner, J. J. Holdzkom II, and A. D. Kirwan, Jr., 1994: An investigation of the ability of nonlinear methods to infer dynamics from observables. *Bull. Am. Meteor. Soc.*, **75**, 1623-1633.
- P-Lipphardt, B. L., Jr., R. P. Mied, A. D. Kirwan, Jr., and G. J. Lindemann, 1994: Evolution of a rotating modon in a primitive equation model. Elsevier volume of proceedings of Amsterdam vortex conference. *Modelling of Oceanic Vortices*. Verhandelingen Koninklijke Academie voor Wetenschappen (KNAW) North Holland, Elsevier. C. J. P. van Heijst, Ed.
- P-Kirwan, A. D., Jr., and B. L. Lipphardt, Jr., 1993: Coherent flows with near zero potential vorticity. *J. Mar. Sys.*, **4**, 95-115.
- P-Kirwan, A. D., Jr., and J. Liu, 1993: Streaks in the vicinity of an oscillating front. *J. Geophys. Res.*, **98**, 2533-2542.
- P-Mied, R. P., A. D. Kirwan, Jr., and G. J. Lindemann, 1992: Rotating modons over isolated topographic features. *J. Phys. Oceanogr.*, **22**, 1569-1582.
- P-Kirwan, A. D., Jr., B. L. Lipphardt, Jr., and J. Liu, 1992: Negative potential vorticity lenses. *Int. J. Eng. Sci.*, **30**, 1361-1378.
- PS-Mied, R. P., A. D. Kirwan, Jr., and B. L. Lipphardt, Jr., 1994: Rotating modons in a stratified ocean over isolated topography. *Dyn. Atmos. Oceans*.
- PS-Hooker, S. B., J. W. Brown, R. P. Mied, G. J. Lindemann, and A. D. Kirwan, Jr., 1994: Modeling warm core rings as rotating modons. *J. Geophys. Res.*
- PS-Ivanov, L. M., A. D. Kirwan, Jr., and T. M. Margolina, 1994: On the spectral reconstruction of scalar fields in oceanography. *J. Geophys. Res.*
- PS-Holdzkom, J. J. II, S. B. Hooker, and A. D. Kirwan, Jr., 1994: A comparison of a hydrodynamic lens model to observations of a warm core ring. *J. Geophys. Res.*
- PI-Hooker, S. B., J. W. Brown, and A. D. Kirwan, Jr., 1994: Detecting "dipole ring" separatrices with zebra palettes, for *IEEE Trans. Geosci. Remote Sensing*.

- PI-Hooker, S. B., J. W. Brown, A. D. Kirwan, Jr., and R. P. Mied, 1994: Are Gulf Stream rings really monopoles?, for *Science*.
- PI-Hooker, S. B., J. W. Brown, A. D. Kirwan, Jr., G. J. Lindemann, and R. P. Mied, 1994: A kinematic investigation of warm core ring dipoles, for *J. Geophys. Res.*
- C-Kirwan, A. D., Jr., B. L. Lipphardt, Jr., and R. P. Mied, 1994: Multipole vortices in the Gulf of Mexico. AGU ASLO Ocean Sciences Meeting, 21-25 February, San Diego, Ca.
- C-Kirwan, A. D., Jr., S. B. Hooker, J. W. Brown, R. P. Mied and G. J. Lindemann, 1994: Warm core rings: monopoles or dipoles? AGU ASLO Ocean Sciences Meeting, 21-25 February, San Diego, Ca.
- C-Lipphardt, B. L., Jr., A. D. Kirwan, Jr., and R. P. Mied, 1994: Kinematics of dipoles from a baroclinic modon solution. AGU ASLO Ocean Sciences Meeting, 21-25 February, San Diego, Ca.
- C-Holdzkom, J. J. II, A. D. Kirwan, Jr., C. E. Grosch, M. Zubair, and N. Kauser, 1994: Particle in cell simulations of coastal flows using massively parallel computers: preliminary results. AGU ASLO Ocean Sciences Meeting, 21-25 February, San Diego, Ca.
- C-Mullen, C., and A. D. Kirwan, Jr., 1994: Surface flow structure of the Gulf Stream from composite imagery and satellite-tracked drifters. AGU ASLO Ocean Sciences Meeting, 21-25 February, San Diego, Ca.
- C-Kirwan, A. D., Jr., B. L. Lipphardt, Jr., and R. P. Mied, 1994: Baroclinic rotating modons: exact solutions to the nonlinear potential vorticity equations. EGS XIX General Assembly, 25-29 April, Grenoble, France.
- C-Toner, M., and A. D. Kirwan, Jr., 1994: Topology of a chaotic two-dimensional climate model. EGS XIX General Assembly, 25-29 April, Grenoble, France.
- C-Kirwan, A. D., Jr., J. J. Holdzkom II, 1994: Dynamical systems aspects of a nonlinear hydrodynamic lens model. EGS XIX General Assembly, 25-29 April, Grenoble, France.
- C-Kirwan, A. D., Jr., S. B. Hooker, and J. W. Brown, 1994: Monopole and dipole ring interactions with the Gulf Stream. EGS XIX General Assembly, 25-29 April, Grenoble, France.
- C-Kirwan, A. D., Jr., C. E. Grosch, J. J. Holdzkom II, N. Kauser, and M. Zubair, 1994: Particle in cell simulations of MMPs: very large dynamical systems. EGS XIX General Assembly, 25-29 April, Grenoble, France.
- C-Kirwan, A. D., Jr., 1994: The dynamics of steady-rotating baroclinic multipole vortex systems. International Conference on Nonlinear Dynamics and Pattern Formation in the Natural Environment (ICPF 94), July 4-7, Leehwenhorst Congress Centre, Noordwijkerhout, The Netherlands.
- C-Kirwan, A. D., Jr., 1994: Particle in cell simulations of oceanic flow. International Conference on Nonlinear Dynamics and Pattern Formation in the Natural Environment (ICPF 94), July 4-7, Leehwenhorst Congress Centre, Noordwijkerhout, The Netherlands.
- C-Kirwan, A. D., Jr., 1994: The inside story on ocean eddies. The University of South Florida, Department of Marine Science Alumni Research Symposium, 27 October, St Petersburg, Fl.
- C-Kirwan, A. D., Jr., 1993: A historical perspective on prediction of atmospheric and oceanic flows. Chapman Conference on Fractals, Chaos, and Predictability in Oceanography and Meteorology, 20-22 September, Galway, Ireland.

- C-Kirwan, A. D., Jr., 1993: Rotating modons in a stratified ocean: a dynamical systems view. Chapman Conference on Fractals, Chaos, and Predictability in Oceanography and Meteorology, 20-22 September, Galway, Ireland.
- C-Lipphardt, B. L., Jr., R. P. Mied, A. D. Kirwan, Jr., and G. J. Lindemann, 1993: Evolution of a rotating barotropic modon in a primitive equation model. Netherlands Academy of Sciences, Modeling of Oceanic Vortices, August, Amsterdam, The Netherlands.
- IC-Kirwan, A. D., Jr., 1994: Ocean/shelf exchange. CCPO Visiting Scientist Lecture Series, 11 October, Norfolk, Va.
- IC-Kirwan, A. D., Jr., 1994: Coastal physical oceanography and chaos. SACLANT Undersea Research Centre, 19 January, La Spezia, Italy.
- IC-Kirwan, A. D., Jr., 1994: Ocean Eddies: the inside story. William & Mary, Department of Physics, 17 May 1994. Williamsburg, Va.
- IC-Kirwan, A. D., Jr., 1994: Quasigeostrophic multipole vortices, Department of Mathematics, University of Stuttgart, 3 May, Germany.
- IC-Kirwan, A. D., Jr., 1994: Modons: the inside story on ocean eddies. Mathematics Department, Brown University, 27 September, Providence, Ri.
- IC-Kirwan, A. D., Jr., E. E. Posmentier, J. J. Holdzkom II, M. Toner, 1993: Chaos and stochasticity in a toy climate model, EGS XVIII General Assembly, April, Wiesbaden, Germany.

Section C. Statistical information for FY93/94

I. Patents and awards---0

II. Statistics

1. _ papers published, refereed journals---3
 2. - papers submitted or in press, refereed journals---7
 3. - books or chapters published, refereed publication---2
 4. - books or chapters submitted, refereed publication---0
 5. - invited presentations at scientific conferences---5
 6. - contributed presentations---13
 7. - technical reports and papers, non-refereed journals---0
 8. - undergraduate students supported*---0
 9. - graduate students supported*---3
 10. - post-docs supported*---0
 11. - other professional personnel supported*---1
- *supported means at least 25% support on this ONR grant

EEO/Minority support:

12. - female grad students---1
13. - minority grad students---0
14. - Asian grad students---0
15. - female post-docs---0
16. - minority post-docs---0
17. - Asian post-docs---0

Minorities includes Blacks, Aleuts, American Indians and Hispanics only.